



January 13, 2014

L-2014-001  
10 CFR 50.73

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Re: St. Lucie Unit 1  
Docket No. 50-335  
Reportable Event: 2013-002-00  
Date of Event: November 12, 2013

**Unplanned Manual Reactor Trip Due to Digital-Electro-Hydraulic (DEH) System Leak**

The attached Licensee Event Report 2013-002-00 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

A handwritten signature in black ink, appearing to read "Joseph Jensen", written over a circular stamp or seal.

Joseph Jensen  
Site Vice President  
St. Lucie Plant

JJ/lrb  
Attachment

IEZZ  
NRK

<b>NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION</b> (10-2010)					APPROVED BY OMB: NO. 3150-0104      EXPIRES: 10/31/2013 Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.						
<b>LICENSEE EVENT REPORT (LER)</b>											
<b>1. FACILITY NAME</b> St. Lucie Unit 1					<b>2. DOCKET NUMBER</b> 05000335		<b>3. PAGE</b> 1 OF 3				
<b>4. TITLE</b> Unplanned Manual Reactor Trip Due to Digital-Electro-Hydraulic (DEH) System Leak											
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
11	12	2013	2013	- 002 - 00		01	13	2014	FACILITY NAME	DOCKET NUMBER	
<b>9. OPERATING MODE</b>  <div style="text-align: center; font-size: 2em;">1</div>			<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)</b>								
<b>10. POWER LEVEL</b>  <div style="text-align: center; font-size: 1.5em;">90%</div>			<input type="checkbox"/> 20.2201(b)		<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> 50.73(a)(2)(vii)		
			<input type="checkbox"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2203(a)(1)		<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(2)(i)		<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		Specify in Abstract below or in NRC Form 366A			
<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> OTHER					
<input type="checkbox"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(v)(D)							
<b>12. LICENSEE CONTACT FOR THIS LER</b>											
<b>NAME</b> Lyle R. Berry - Principal Engineer, Licensing								<b>TELEPHONE NUMBER (Include Area Code)</b> 772-467-7680			
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>											
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURE	REPORTABLE TO EPIX		
B	TG	TBG	S958	Y							
<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO							<b>15. EXPECTED SUBMISSION DATE</b>		MONTH	DAY	YEAR
<b>ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)</b>											
<p>On November 12, 2013 St. Lucie (PSL) Unit 1 was manually tripped due to a digital-electro-hydraulic (DEH) fluid leak from a tubing fitting in the turbine control system. Prior to the reactor trip, PSL Unit 1 was at 90% power ascending to 98% power following the SL1-25 refueling outage. Following the reactor trip, emergency operating procedures were successfully completed and the unit was stabilized in Mode 3. The reactor trip was uncomplicated. All systems functioned as designed. There were no automatic safety system actuations as a result of the trip.</p> <p>A root cause evaluation was performed which identified the cause as failure of a DEH tubing fitting as the result of high cycle fatigue fracture and inadequate tubing support following a DEH pump replacement.</p> <p>Corrective actions include: 1) update of the engineering procedure for post-modification testing and 2) update of the maintenance procedure for post-maintenance testing, to inspect for vibration and inadequate support of adjacent tubing/piping after a change to a vibration inducing component (pump, fan, etc.)</p> <p>This reactor trip event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as a manual actuation of reactor protection system (RPS). This event had no significant safety consequence. Given the response of the plant and the actions taken, the health and safety of the public was not affected by this event.</p>											

LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET

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## NARRATIVE

## Description of the Event

On November 12, 2013 St. Lucie (PSL) Unit 1 was manually tripped due to a digital-electro-hydraulic (DEH) fluid leak from a cracked 1/4" Swagelok port connector tubing fitting in the turbine control system. Prior to the reactor trip, PSL Unit 1 was at 90% power ascending to 98% power following the SL1-25 refueling outage. Following the reactor trip, emergency operating procedures for standard post-trip actions and reactor trip recovery were successfully completed and the unit was stabilized in Mode 3. The reactor trip was uncomplicated.

## Cause

A root cause analysis performed for this event identified the following causes:

Root Cause RC1: A change to the forcing frequency on the DEH cabinet caused the tubing connected to the differential pressure switch for the electro-hydraulic pump discharge filter to resonate and fail at a port connector due to high cycle fatigue. The change in vibration occurred as a result of the replacement of the Unit 1 DEH pumps with a different forcing frequency.

Root Cause RC2: The tubing assembly was not adequately supported when CAJON<sup>®</sup> tee connections were installed adjacent to the port connectors to allow testing in support of turbine test blocks. The mass of the CAJON<sup>®</sup> tee connections installed adjacent to the port connectors resulted in the tubing being overstressed by the vibration created by the replaced DEH pumps.

## Analysis of Safety Significance

The DEH System is Quality Group D, non-seismic. The DEH System does not perform a safety function, and is not required to mitigate the consequences of a design basis accident; therefore it is considered Non-Nuclear Safety. All safety related systems functioned as designed. There were no safety system actuations as a result of the trip.

This reactor trip event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as a manual actuation of reactor protection system (RPS). This event had no significant safety consequence. Given the response of the plant and the actions taken, the health and safety of the public was not affected by this event.

## Immediate Corrective Actions

1. Removed the CAJON<sup>®</sup> tee connectors and port connectors and re-supported four similar tubing installations inside the DEH cabinet. COMPLETE

## Corrective Actions

1. Update the engineering procedure for post-modification testing to inspect for vibration and inadequate support of adjacent tubing/piping after a change to a vibration inducing component (pump, fan, etc.) which changes its forcing frequency.
2. Update the maintenance procedure for post-maintenance testing to inspect for vibration and inadequate support of adjacent tubing/piping after a change to a vibration inducing component (pump, fan, etc.) which changes its forcing frequency.

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## NARRATIVE

**Similar Events**

A search and review of data in the St. Lucie Corrective Action Program Database addressing the past five years revealed no previous occurrences or similar events.

**Failed Component(s)**

Swagelok 1/4" port connector (TBG)

August 1989 Swagelok Catalogue

Catalogue Number -401-PC

**Manufacturer**

Swagelok Company